

Groundbased Cometary Studies

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Strategy

In this grant we seek to understand the physical properties of comets by applying a wide variety of observational techniques. We particularly emphasize simultaneous or coordinated observations in different spectral regions (e.g. visible and thermal I.R. or visible and far U.V.) or with different instrumentation (imaging, spectroscopy, photometry). We aim to (1) measure the basic properties of cometary nuclei by studying comets whose comae are so anemic that the signal from the nucleus can be extracted, (2) investigate the group characteristics of comets by narrowband photometry applied uniformly to a large sample of comets, (3) understand the detailed physics and chemistry occurring in cometary comae through wide-field CCD imaging using narrow filters and through long-slit CCD spectroscopy, and (4) investigate the rotational states of comets through time-resolution photometry.

Progress and Accomplishments

In the past year (under our previous grant "Planetary Research at the Lowell Observatory") we have conducted three major observing campaigns, along with several other investigations. Photometric observations of Comet Levy (1990c) began in early July 1990 and continue into 1991. Strong asymmetry about perihelion was observed for all species. Time-resolution monitoring of Levy in late August revealed periodic variations with a 19 hr period. Levy is the first long-period comet in which rotational variations have been observed using photometric techniques. In May and June 1990, an extensive set of coordinated observations of Comet Austin (1989c1) were acquired using a conventional photometer on the Lowell 42-inch telescope, a long-slit CCD spectrograph on the Perkins 72-inch telescope, and a Texas Instruments 800 by 800 CCD on a Takahashi e-200 f/4 telescope. Observations of Comet P/Encke were obtained in October in order to better understand the apparent decoupling of OH from other species seen in earlier apparitions of this comet at small heliocentric distances. We have performed an analysis of photographic photometry of Comet P/Halley from the 1910 apparition. Based on these old observations, we have been able to present strong evidence that Halley exhibited the same 7.4-day brightness variations in 1910 that we discovered during the recent apparition.

Projected Accomplishments

In the next year, emphasis in this research program will be given to analysis and publication of our data sets on Comets Levy and P/Halley, and of our total database of comet photometry (now numbering 80 comets). Coordinated visible and infrared observations of Comet P/Faye are planned which, if successful, will yield the dimensions, albedo, color, and rotational period of this comet's nucleus. Finally, observations of newly discovered comets will be undertaken as circumstances warrant.

Publications

Bus, S. J., A'Hearn, M. F., Schleicher, D. G., and Bowell, E. (1990) "Detection of CN Emission from (2060) Chiron", *Science* **251**, 774-777.

Osborn, W., A'Hearn, M. F., Carsenty, U., Millis, R. L., Schleicher, D. G., Birch, P. V., Moreno, H., Gutierrez-Moreno, A., and Wenderoth, E. (1990) "Standard Stars for Comet Photometry", *Icarus* **88**, 228-245.

Schleicher, D. G. (1990) "Production Rates of Comet Austin (1989c1)", IAU Circular No. 5004.

Schleicher, D. G., and Bus, S. J. (1991) "Comet P/Halley's Periodic Brightness Variations in 1910", *Astron. J.* **101**, 706-712.

Schleicher, D. G., Millis, R. L., and Osip, D. J. (1990) "Periodicity and Production Rates of Comet Levy (1990c)", IAU Circular No. 5081.

Schleicher, D. G., Millis, R. L., Thompson, D. T., Birch, P. V., Martin, R., Tholen, D. J., Piscitelli, J. R., Lark, N. L., and Hammel, H. B., (1990) "Periodic Variations in the Activity of Comet P/Halley During the 1985/1986 Apparition", *Astron. J.* **100**, 896-912.

Schleicher, D. G., Osip, D. J., and Birch, P. V. (1990) "Production Rates of Comet Austin (1989c1)", IAU Circular No. 4983.

Schleicher, D. G., Osip, D. J., Kreidl, T. J., and Sauter, L. M. (1990) "Production Rates of Comet Levy (1990c)", IAU Circular No. 5029.

Schleicher, D. G., and Osip, D. J. (1990) "Production Rates of Comet Austin (1989c1)", IAU Circular No. 5001.

Schleicher, D. G., Osip, D. J., Millis, R. L., Thompson, A., and Sauter, L. M. (1990) "Photometric Narrowband CCD Imaging of Comets P/Brorsen-Metcalf and Austin (1989c1)", in *Workshop on Observations of Recent Comets (1990)*, 8-12.